

Appendix J

Watershed assessment

Introduction

This appendix presents information on assessment of watershed conditions from several sources, including:

- A watershed condition assessment conducted by the forest for the 2002 Forest Plan (**Tables J-1 through J-6**);
- The 1998 Colorado State monitoring and evaluation list of stream segments with suspected water quality problems that occur on the forest (**Table J-7**);
- The 1998 Colorado State 303(d) list of water-quality-limited stream segments still requiring total maximum daily load (TMDL) assessments (**Table J-8**); and
- A Colorado Geological Survey of abandoned mines on or adjacent to the forest (**Table J-9**).

Watersheds are areas of land that drain rainfall and snowmelt into a common stream, stream network, body of water, or closed basin. The Rocky Mountain Region (Region 2) of the Forest Service has adopted the hydrologic unit code (HUC) system developed by the U.S. Geological Survey (USGS). It divides watersheds into a series of progressively smaller nested levels, with the first level being the largest land area relative to higher-numbered levels in that watershed. Each level is identified systematically by a hydrologic unit code number, or HUC. A first level watershed can be divided into a number of second level watersheds, each second level watershed may be further subdivided into third-level watersheds, and so forth. For forest planning purposes, fourth- through sixth-level watersheds are the most appropriate scale of analysis. Fourth-level watersheds are often referred to as sub-basins; fifth-level watersheds are often just called watersheds, and sixth-level watersheds may also be called subwatersheds. The terms HUC, level, and field are often used interchangeably.

The watershed risk assessment was conducted to provide a general picture of the risks of further activity to watershed health. The assessment was also used, along with professional knowledge, to help determine the condition class of each sixth-level watershed that contains 10 percent or more National Forest System (NFS) lands.

This process supporting the risk assessment consisted of the following steps:

- Identification of landscape processes and resource conditions of concern, such as erosion, riparian condition, and impairment of water uses;
- Identification of data sources which would facilitate evaluation of these processes and conditions, such as USGS maps, soil surveys, and state 305b reports;
- Collection or aggregation data for each sixth-level watershed for each process or condition;

- Development of ratings for each process and condition based on thresholds, relative frequency, or other criteria. A three level rating system was used corresponding to a low, medium, or high level of risk or concern;
- Combining ratings for individual factors into two composite ratings, one for sensitivity to natural factors and one for sensitivity to human-influenced factors; and
- Combining these two composite ratings into a single rating for each watershed.

Assessments of watersheds with a rating of '1' suggest that the soil, aquatic, and riparian systems are predominantly functional. The assessments suggest that these systems are at risk in watersheds with a '2' rating and unstable in watersheds with a '3' rating. This watershed risk assessment and the resulting ratings have no sanction or regulatory consequences. The process was designed to develop an overview of watershed conditions in the forest, and is being used for communication with other agencies and the public, and for scoping in project planning.

Following is an explanation of each of the factors used in the watershed risk assessment, including rationale, data sources, and criteria for calculating the ratings. Care must be taken not to extend interpretations of these ratings beyond the context in which they were developed. These rating values are based upon comparisons between the watersheds that fall within the forest boundaries, and therefore may not necessarily be comparable to watersheds outside the forest. In addition, the ratings were developed at a landscape scale of analysis and therefore should only be used for scoping, when used at a project or site-specific level of analysis.

Final ratings for each sixth-level watershed were mapped for each risk assessment component. These are available in the project record for this Final Environmental Impact Statement (FEIS). Condition assessment ratings for watersheds for each Geographic Unit are found in tables 1 through 6 at the end of this document.

NATURAL FACTORS

Slope stability

Natural factors are inherent watershed characteristics that affect sensitivity to ground disturbing activities.

The slope stability ratings were developed by Tony Svatos, Forest Soil Scientist (now retired), to determine the risk of mass movement on the forest. Lands were identified for their suitability to sustained timber production with respect to the risk of irreversible resource damage to soil productivity or watershed condition. The rating system was intended for broad land use allocation and planning purposes.

Susceptibility to landslides was evaluated by grouping the 24 possible combinations of the ratings for each of following three indicators: geology, slope percentage, and the past occurrence of landslides. Sources of information include the following:

- **Geology** (USGS *Geologic Map of Colorado* (1:500,000)): Based on their inherent risk of instability, the bedrock and surficial units were grouped into three classes: (1) low risk, (2) moderate risk, and (3) high risk;
- **Slope percentage** (USGS Digital Elevation Model): Slope gradients were grouped into four classes: (1) 0 to 40 percent, (2) 40 to 50 percent, (3) 50 to 65 percent, and (4) greater than 65 percent; and
- **Landslide risk** (USGS Preliminary Map of Landslide Deposits for the Leadville, Montrose, Craig, Grand Junction, and Denver 1 X 2 degree quadrangles

(1:250,000)): These maps were completed in the mid-1970s and were based on aerial photographs from flights in the mid-1950s. Landslide coverage was shown as a yes or no depending on whether the USGS map showed the occurrence of landslide deposits.

The grouping of the 24 different combinations resulted in six overall ratings for land stability:

- **Severe (7):** Primarily landslides occurring on slopes greater than 50 percent on moderate to high-risk geology. Groupings (geology, slope, landslides): (1, 4, yes), (2, 3, yes), (2, 4, yes), (3, 3, yes), (3, 4, yes), (3, 4, no);
- **High (6):** Primarily moderate to high-risk geology on slopes greater than 50 percent without the occurrence of landslides. Groupings: (2, 4, no), (3, 3, no);
- **Moderate-high (5):** Primarily low to high-risk geology on slopes with landslides occurring on slopes greater than 40 percent. Groupings: (1, 3, yes), (1, 4, no), (2, 2, yes), (3, 2, yes);
- **Moderate-low (4):** Moderate to high-risk geology with landslides occurring on low risk geology or on slopes less than 40 percent. Groupings: (1, 2, yes), (2, 3, no), (3, 1, yes), (3, 2, no);
- **Low (3):** Primarily low and moderate risk geology with landslides occurring on slopes less than 40 percent. Groupings: (1, 1, yes), (1, 2, no), (1, 3, no), (2, 1, yes), (2, 2, no), (3, 1, no); and
- **Slight (2):** No occurrence of landslides on low and moderate risk geology on slopes less than 40 percent. Groupings: (1, 1, no), (2, 1, no).

Ratings were based on the percentage in each watershed of the higher risk lands: *severe*, *high*, and *moderate-high*. A frequency distribution of these percentages was graphed and three rating categories selected from this data. The ratings are described as follows:

- **High (3):** Greater than 25 percent of the watershed with high risk of land instability;
- **Moderate (2):** Between 5 percent and 25 percent of the watershed with high risk of land instability; and
- **Low (1):** Less than 5 percent of the watershed with high risk of land instability.

Runoff potential

The rate of runoff is an important factor in determining the risk of erosion and sedimentation within a watershed. The *hydrologic soil group* property was used to evaluate this factor. Developed as a classification system based on soil infiltration rates after a period of prolonged wetting, there are four hydrologic soil groups: A, B, C, and D. Soils classified as C or D have a lower infiltration capacity than A or B soils, and thus shed more water as overland flow during a rainfall or snowmelt event. The tendency toward higher rates of surface runoff in C and D soils increases the risk of surface erosion, flooding, and sediment delivery to stream channels.

Information on hydrologic soil groups was derived from unpublished soil surveys of areas within the forest. The high runoff potential rating was arrived at by calculating the acreages of hydrologic soil groups C and D for each sixth-level watershed and displaying the result as a percentage of each watershed's total acreage. A frequency distribution of these percentages was graphed. Three rating categories were selected and differentiated

by selecting breaks in the graphed data. Selection of these breaks was assisted by local professional field experience with regard to where high runoff occurred.

The breaks selected are:

- **High sensitivity to runoff (3):** 50 percent or more of the watershed contains soils within C and/or D hydrologic soil groups;
- **Moderate sensitivity to runoff (2):** Greater than 15 percent and less than 50 percent are C and/or D soils; and
- **Low sensitivity to runoff (1):** 15 percent or less are C and/or D soils.

Erosion hazard

The risk of soil detachment by water in each sixth-level watershed on the forest was estimated using the *K-factor* soil erodibility property. The K-factor is one of the elements used in erosion prediction equations such as the Universal Soil Loss Equation (USLE). It is defined as a factor that quantifies the susceptibility of soil detachment by water (SCS 1993). The K-factor is used here to provide an overall estimate of a watershed's soil resistance to surface erosion from rainfall and runoff. Through professional judgement, a K-factor greater than 0.24 was chosen as an indicator for a soil's susceptibility to detachment by water (personal communication, Gregory Kuyumjian, 03/30/98). Data sources for the K-factor were two unpublished soil surveys that include forest lands.

Acres of soils with a K-factor greater than 0.24 were tallied for each watershed and converted to a percentage of the basin's total acreage. Professional judgment was used in delineating watershed ratings (i.e., high to low risk of erosion), and consideration was made for watersheds that contained areas with very high K-factor values (K-factor greater than 0.37). The general rating scheme is:

- **High erosion hazard (3):** 70 percent or greater of watershed with K-factor greater than 0.24. For watersheds that contain soils with very high K-factors, an adjustment was made in the percentages that applied, based on professional knowledge. For instance, if 60 percent of a watershed had K-factor greater than 0.37, it was rated a 3;
- **Moderate erosion hazard (2):** Between 30 and 69 percent of watershed with K-factor greater than 0.24; and
- **Low erosion hazard (1):** Less than 30 percent of watershed with K-factor greater than 0.24.

Water-influenced vegetation

The term *water-influenced vegetation* applies to areas with a relatively high percentage of wetland and riparian vegetation. This term is used to avoid the regulatory implications of *wetlands* and the variable definition of *riparian*. The source of information for this factor was a digitized map created through interpretation of 1:58,000-scale color infrared aerial imagery (Thurston, Reiners, and Driese, 1995). Resolution of the data mapped did not always include riparian vegetation around lakes or streams due to the scale limitations of the imagery.

This factor was rated by the percentage of water-influenced vegetation that occurred within a watershed. Watersheds with relatively low percentages of water-influenced vegetation were given the same rating as those with high percentages, because a watershed with minimal acreage of water influenced vegetation presents a higher risk of losing what little that area contains; and watersheds with relatively higher acreage of this

vegetation type also present a high risk of impact due to a greater probability of encountering water-influenced vegetation.

Thresholds are as follows:

- **High risk (3):** Watersheds with 0.1 to 0.9 percent or over 6 percent water influenced vegetation;
- **Moderate risk (2):** Watersheds with 1 to 2 percent or 3.1 to 6 percent water-influenced vegetation; and
- **Low risk (1):** Watersheds with no or 2.1 to 3 percent water-influenced vegetation.

Stream density

Stream density represents an integration of a watershed's inherent topography, vegetation cover, and soil characteristics, and their influence on runoff. A higher stream density indicates greater risk of sedimentation due to a larger network of stream channels that act as efficient conveyors of natural and human-caused sediments from uplands, as well as instream erosion.

Data sources for determining stream density are USGS 7.5 minute topographic maps. Additional streams were determined using contour crenulation, a process in which channels are extended beyond the blue lines on USGS contour maps. Crenulations are mapped as channels when two consecutive contours each form an angle of 120 degrees or less and point upstream (IRI handbook).

The ratings for this factor were determined using a frequency distribution of stream densities (miles per square mile). Three rating categories were initially selected and differentiated by selecting breaks in the graphed data. Selection of these breaks was assisted by local professional field experience with regard to where water resource problems begin to escalate in relation to stream density. The categories of this factor are:

- **High stream density (3):** Stream density greater than 4.8 miles per square mile;
- **Moderate stream density (2):** Stream density 2.6 to 4.8 miles per square mile; and
- **Low stream density (1):** Stream density less than 2.6 miles per square mile.

HUMAN INFLUENCED FACTORS

The human-influenced factors reflect current management situations that include ground disturbing management activities, water use impairment designations, diversions, and generalized overviews of watershed health. These factors recognize management and development activities that influence watershed health and emphasize watersheds where special precautions are needed to prevent or reverse watershed degradation.

Linear disturbance

Linear disturbances have the potential to significantly affect watershed condition by acting as direct conduits for runoff and sediments to reach a stream channel. In some cases, such disturbances may be constructed such that they undercut an already unstable slope leading to landslides or slumps. Linear disturbances in this analysis include roads, trails, ditches, aqueducts, tunnels, pipelines, transmission lines, and railroads. Initially each sixth-level watershed was ranked in terms of its density of linear disturbances. The rankings for each watershed were then reviewed and, in a few cases, changed based on first hand knowledge of a watershed's condition. For instance, if a watershed had a high density of linear disturbances that included only trails and transmission lines, and it was known that there were few resulting problems, the watershed's rating would be changed

to a lower value. Documentation of these changes can be found in the spreadsheet developed for the watershed condition assessment.

Breaks in the ratings for linear disturbances are as follows:

- **High (3):** Watersheds with 3.0 or greater miles per square mile;
- **Moderate (2):** 1.5 to 2.9 miles per square mile; and
- **Low (1):** 1.4 miles per square mile or less.

Water use impairment

All stream segments in Colorado (including all tributaries and standing bodies of water) are assigned classifications and numeric water quality standards by the state. The classifications identify an actual or targeted beneficial use of the water, such as aquatic life, recreation, water supply, or agriculture. These classifications can be found in the Colorado Department of Health, Water Quality Control Commission's *Classifications and Numeric Standards for Colorado*.

Biannually, the state reports on the status of water quality in each stream segment using four general ratings:

- Fully supporting (designated ratings are not measurably impaired due to water quality);
- Limited (potential for impairment not immediate but expected in near future);
- Partially supporting (some interference with designated uses); and
- Not supporting (designated uses measurably impaired from water pollution).

Information for this assessment also comes from the Water Quality Control Commission and is titled *Status of Water Quality in Colorado, 1998* (this is the 305b report).

The state-designated stream segments often incorporate a broad area and, in some cases, its water quality designations are based on the impacts of activities downstream of the forest boundaries. For this reason, impairments to stream segments within NFS lands were analyzed by Forest and District specialists, and documented in a Watershed Risk Assessment form kept in the Supervisor's Office files. Thus water use impairment, as used in this assessment, may not mirror that of the state.

Ratings are generally as follows with slight modifications made on a case-by-case basis:

- **High (3):** Water uses rated impaired or not supported;
- **Moderate (2):** Water uses are partly supported or limited; and
- **Low (1):** All uses are fully supported.

Riparian condition

The ratings for riparian condition are based upon reports, anecdotal information, and field knowledge from Forest and District specialists. The ratings reflect the overall condition of the riparian zones on the forest. The following ratings are applied:

- **High (3):** Watersheds where the riparian community in some reaches is unhealthy. Changes in management combined with capital investments are needed to obtain improvement;
- **Moderate (2):** Watersheds where the riparian community in some reaches is at risk for degradation and management of these lands needs to occur with an emphasis on improving riparian function; and
- **Low (1):** The riparian zone within a watershed is healthy. Current management does not need to change.

Impairments to aquatic life

The ratings for impairments to aquatic life highlight the condition of the fisheries on the forest. These ratings were based on Forest Service fishery survey reports, available in the Supervisor's Office, as well as information available through a database kept by the Colorado Division of Wildlife. The following ratings are applied:

- **High (3):** Significant impairments to the fishery are present in the watershed.
- **Moderate (2):** Healthy fishery exists within the watershed but native species are not present; and
- **Low (1):** Native aquatic fauna are present in at least a portion of the watershed. This includes watersheds with Colorado River cutthroat trout and watersheds that were historically and still are barren.

Instream flow

The ratings for instream flow highlight those watersheds where instream flows have been established or are desirable. Instream flow rights include those held by the Forest Service, the Colorado Water Conservation Board, or other agencies. No analysis has been done on the adequacy of the existing instream flow rights. Each watershed is rated as follows:

- **High (3):** No established instream rights, higher priority for acquisition;
- **Moderate (2):** No established instream rights, lower priority for acquisition; and
- **Low (1):** Some instream rights established.

Public water supply/transbasin diversions

The ratings for public water supply/transbasin highlight those watersheds that provide either municipal water to local communities or transbasin diversions to Front Range communities. These diversions may have an impact on downstream flows. Forest management activities may be restricted upstream of such diversions. Watersheds are rated as follows:

- **High (3):** Transbasin diversion occurs within the sixth-level watershed. The assumption is that transbasin diversions are typically significant in the amount of water diverted from the forest;
- **Moderate (2):** Public water supply diversion occurs within the sixth-level watershed;
- **Low (1):** No transbasin or public water supply diversions occur.

Table J-1
Watershed Condition Assessment for Blue River Unit

6th level HUC	Blue River Unit Watershed Name	Watershed Condition Class
14010020105	Deep Creek	2
14010020106	Elliott Creek	1
14010020201	Green Mountain Reservoir Composite	2
14010020202	Cataract Creek	2
14010020203	Otter Creek	1
14010020204	Black Creek	1
14010020205	Brush Creek	1
14010020206	Middle Blue River Composite	3
14010020207	Squaw Creek	2
14010020208	Pass Creek	1
14010020209	Slate Creek	1
14010020210	Big Gulch	3
14010020211	Acorn Creek	2
14010020212	Harrigan Creek	1
14010020213	Boulder Creek	1
14010020214	Quaking Aspen Creek	1
14010020215	Rock Creek	1
14010020216	Pioneer Creek	1
14010020217	Maryland Creek	1
14010020218	Bushee Creek	1
14010020219	Blue River in Dillon Composite	3
14010020220	Willow Creek	1
14010020221	Salt Lick Gulch	2
14010020222	Straight Creek	3
14010020301	Dillon Reservoir Composite	2
14010020302	Soda Creek	2
14010020303	Miners Creek	2
14010020304	Meadow Creek	2
14010020401	Lower Snake River Composite	3
14010020402	Frey Gulch	2
14010020403	Keystone Gulch	2
14010020404	North Fork Snake River	3
14010020405	Middle Snake River Composite	3
14010020406	Jones Gulch	2
14010020407	Peru Creek	3
14010020408	Upper Snake River	3
14010020501	Blue River at Gold Hill Composite	3
14010020502	Swan River	2
14010020503	Barton Gulch	2

6th level HUC	Blue River Unit Watershed Name	Watershed Condition Class
14010020504	Cucumber Creek	1
14010020505	French Gulch	3
14010020506	Blue River at Breckenridge Composite	3
14010020507	Sawmill Gulch	2
14010020508	Lehman Gulch	2
14010020509	Indiana Creek	1
14010020510	Spruce Creek	1
14010020511	Pennsylvania Creek	1
14010020512	McCullough Gulch	1
14010020513	Monte Cristo Creek	3
14010020514	Upper Blue River	3
14010020601	Lower Tenmile Creek Composite	3
14010020602	North Tenmile Creek	1
14010020603	Uneva Lake	1
14010020604	Officers Gulch	1
14010020605	West Tenmile Creek	2
14010020606	Middle Tenmile Creek	2
14010020607	Upper Tenmile Creek	3
14010020608	Clinton Creek	2
14010020609	Searle Gulch	2

Table J-2
Watershed Condition Assessment for Eagle River Unit

6th level HUC	Eagle River Watershed Name	Watershed Condition Class
14010030203	Old Mans Gulch	2
14010030204	Fish Pond Gulch	1
14010030205	Middle Gypsum Creek Composite	2
14010030206	Gould Creek	1
14010030207	Cherry Creek	1
14010030208	Erickson Creek	1
14010030209	Miller Gulch Creek	1
14010030210	Upper Gypsum Creek Composite	2
14010030211	Sourdough Creek	1
14010030212	Yates Gulch	2
14010030213	White Creek	1
14010030214	Red Creek	1
14010030215	Upper Gypsum Creek	2
14010030302	Abrams Creek	2
14010030303	Third Gulch	2
14010030304	Salt Creek	2
14010030305	Brush Creek around Skim Milk Composite	2
14010030306	Bruce Creek	2
14010030307	Frost Creek	2
14010030308	Beecher Gulch	2
14010030309	East Brush Creek	2
14010030310	Lower West Brush Creek	2
14010030311	Antones Cabin Creek	2
14010030312	Upper West Brush Creek	2
14010030402	Muddy Creek	2
14010030502	Ute Creek	2
14010030503	Red Canyon Creek	1
14010030504	Eagle River around Wilmore Composite	3
14010030505	Squaw Creek	2
14010030506	Eagle River above Edwards Composite	2
14010030507	Berry Creek	2
14010030508	McCoy Creek	2
14010030509	Eagle River below Avon Composite	2
14010030510	June Creek	2
14010030511	Metcalf Creek	2
14010030512	Buck Creek	2
14010030513	Eagle River above Avon Composite	2
14010030514	Beaver Creek	2
14010030515	Nottingham Gulch	2

6th level HUC	Eagle River Watershed Name	Watershed Condition Class
14010030516	Stone Creek	1
14010030601	Lake Creek	1
14010030701	Gore Creek around West Vail Composite	3
14010030702	Buffer Creek	1
14010030703	Red Sandstone Creek	1
14010030704	Middle Creek	1
14010030705	Spraddle Creek	2
14010030706	Mill Creek	2
14010030707	Middle Gore Creek Composite	3
14010030708	Booth Creek	1
14010030709	Pitkin Creek	1
14010030710	Bighorn Creek	1
14010030711	Black Gore Creek	3
14010030712	Upper Gore Creek	1
14010030801	Eagle River above Minturn Composite	2
14010030802	Game Creek	1
14010030803	Grouse Creek	2
14010030804	Cross Creek	2
14010030805	Two Elk Creek	1
14010030806	Fall Creek	1
14010030807	Homestake Creek Composite	2
14010030808	Upper Homestake Creek	2
14010030809	Eagle River above Redcliff Composite	2
14010030810	Turkey Creek	1
14010030811	McAllister Gulch	1
14010030812	Eagle River above Pando Composite	3
14010030813	Resolution Creek	1
14010030814	Yoder Gulch	1
14010030815	East Fork	3
14010030816	South Fork	2

Table J-3
Watershed Condition Assessment for Roaring Fork River Unit

6th level HUC	Roaring Fork River Watershed Name	Watershed Condition Class
140100040104	Upper Cattle Creek	2
140100040204	Blue Creek	2
140100040205	Christine State Wildlife	2
140100040206	Kelly Lake	2
140100040208	West Sopris Creek	1
140100040209	Lower East Sopris Creek Composite	2
140100040210	Upper East Sopris Creek	1
140100040301	Mouth of Fryingpan River Composite	2
140100040302	Toner Creek	1
140100040303	Taylor Creek	1
140100040304	Otto Creek	1
140100040305	Downey Creek	1
140100040306	Frenchman Creek	1
140100040307	Ruedi Creek	2
140100040308	Pond Creek	2
140100040309	Smith Creek	2
140100040310	Freeman Creek	1
140100040311	Two by Four Creek	1
140100040312	Waterbury Creek	1
140100040313	Jakeman Creek	1
140100040314	Suicide/Middle Gulches	1
140100040315	Lime Creek	2
140100040316	North Fork	2
140100040319	Ivanhoe Creek	2
140100040320	Upper Fryingpan River Composite	2
140100040321	Head of Fryingpan River	2
140100040322	Marten Creek	2
140100040323	South Fork Fryingpan River	2
140100040324	Chapman Gulch	2
140100040325	Deeds Gulch	1
140100040326	Deadman Creek	1
140100040327	Miller Creek	1
140100040328	Rocky Fork Creek	1
140100040329	Bear Creek	1
140100040330	Fryingpan River below Ruedi Composite	2
140100040331	Ruedi Reservoir Composite	2
140100040332	Fryingpan River around Norrie Composite	2
140100040401	Roaring Fork River above Basalt Composite	2
140100040402	Wheatley Gulch	1

Table J-3 continued
Watershed Condition Assessment for Roaring Fork River Unit

6th level HUC	Roaring Fork River Watershed Name	Watershed Condition Class
140100040403	Arbaney Gulch	1
140100040404	Red Canyon	2
140100040405	Woody Creek Composite	2
140100040406	Little Woody Creek	2
140100040407	Collins Creek	2
140100040408	Spruce Creek	1
140100040409	Upper Woody Creek	1
140100040410	Roaring Fork River below Aspen Composite	1
140100040411	Brush Creek	3
140100040412	Owl Creek	2
140100040413	Roaring Fork above Snowmass Composite	1
140100040501	Roaring Fork River in Aspen Composite	2
140100040502	Hunter Creek Composite	1
140100040503	Upper Hunter Creek	1
140100040504	Midway Creek	1
140100040505	No Name Creek	1
140100040506	McFarlane Creek	1
140100040507	Difficult Creek	1
140100040508	Roaring Fork River around Tagerts Lake	2
140100040509	Roaring Fork River above the Grottos Composite	2
140100040510	Lower Lincoln Creek	3
140100040511	Upper Lincoln Creek	3
140100040512	Lost Man Creek	2
140100040513	Upper Roaring Fork River	2
140100040601	Lower Castle Creek Composite	2
140100040602	Conundrum Creek	1
140100040603	Upper Castle Creek	2
140100040701	Lower Maroon Creek Composite	2
140100040702	Willow Creek	1
140100040703	West Maroon Creek	1
140100040704	East Maroon Creek	1
140100040805	Nickelson Creek	1
140100040806	Upper Capitol Creek	2
140100040808	Hunter Creek	1
140100040809	East Snowmass Creek	2
140100040810	Upper Snowmass Creek Composite	1
140100040811	West Snowmass Creek	1
140100040902	Prince Creek	2
140100040903	Thomas Creek	2
140100040904	Nettle Creek	1

Table J-3 continued
Watershed Condition Assessment for Roaring Fork River Unit

6th level HUC	Roaring Fork River Watershed Name	Watershed Condition Class
140100040905	Crystal River above Nettle Creek Composite	1
140100040906	Edgerton Creek	1
140100040908	Mouth of Thompson Creek Composite	2
140100040909	Thompson Creek	2
140100040912	North Thompson Creek	2
140100040916	Avalanche Creek	1
140100040917	Crystal River around Redstone Composite	2
140100040918	Coal Creek	3
140100040919	East Creek	1
140100040920	Hawk Creek	1
140100040921	Kline Creek	1
140100040922	Crystal River above Placita Composite	2
140100040923	Rapid Creek	1
140100040924	Milton Creek	1
140100040925	Yule Creek	1
140100040926	Carbonate Creek	2
140100040927	Lost Trail Creek	1
140100040928	North Fork Crystal River	1
140100040929	South Fork Crystal River	1
140100041001	Threemile Creek	2
140100041003	Lower Fourmile Creek Composite	2
140100041004	Upper Fourmile Creek	2

Table J-4
Watershed Condition Assessment for Upper Colorado River Unit

6th level HUC	Upper Colorado River Watershed Name	Watershed Condition Class
140100011602	Cottonwood Creek	2
140100011603	Middle Sheephorn Creek Composite	2
140100011604	Slate Creek	2
140100011605	Lone Lick Creek	2
140100011606	Big Hole Creek	2
140100011607	Upper Sheephorn Creek	2
140100011801	Lower Piney River Composite	2
140100011802	Castle Creek	2
140100011803	Spring Draw	2
140100011804	Aspen Creek	1
140100011805	Box Canyon Creek	1
140100011806	Middle Piney River Composite	2
140100011807	Stark Creek	2
140100011808	Lava Creek	1
140100011809	Rock Creek	2
140100011810	Grape Creek	2
140100011811	Bear Gulch	1
140100011812	South Fork	2
140100011813	Upper Piney River Composite	1
140100011814	North Fork	1
140100011815	Meadow Creek	1
140100011816	Freeman Creek	1
140100011817	Upper Piney River	1
140100012006	McPhee Gulch	3
140100012302	Cabin Creek	2
140100012303	Sunnyside Creek	2
140100012401	Lower Derby Creek Composite	2
140100012402	South Fork	2
140100012403	Middle Fork	2
140100012404	North Fork	2
140100012501	Lower Sweetwater Creek Composite	2
140100012502	Sheep Creek	2
140100012503	Sweetwater Creek below the Lake Composite	2
140100012504	Sweetwater Lake Composite	2
140100012505	Lake Creek	1
140100012506	Turret Creek	1
140100012507	Cross Creek	1
140100012508	Dry Sweetwater Creek	2
140100012509	Upper Sweetwater Creek	1

Table J-4 continued
Watershed Condition Assessment for Upper Colorado River Unit

6th level HUC	Upper Colorado River Watershed Name	Watershed Condition Class
140100012601	Lower Deep Creek Composite	1
140100012603	Middle Deep Creek Composite	1
140100012604	Upper Deep Creek	1
140100012702	Horse Creek	2
140100012706	Red Dirt Creek	2
140100012802	Upper Cottonwood Creek	2
140100012901	Colorado River in Glenwood Canyon Composite	3
140100012902	No Name Creek	1
140100012903	Grizzly Creek	1
140100012904	Dead Horse Creek	1
140100012905	French Creek	1

Table J-5
Watershed Condition Assessment for Lower Colorado River Unit

6th level HUC	Lower Colorado River Watershed Name	Watershed Condition Class
140100050107	East Rifle Creek	2
140100050111	Butler Creek	2
140100050112	Upper Middle Rifle Creek	2
140100050202	East Elk Creek	2
140100050203	Lower Main Elk Creek Composite	2
140100050204	Hadley Gulch	2
140100050205	Deep Creek	2
140100050206	Meadow Creek	2
140100050207	Upper Main Elk Creek	1
140100050209	Upper West Elk Creek	2
140100050302	East Canyon Creek	1
140100050303	Possum Creek	2
140100050304	Bearwallow Creek	1
140100050305	Canyon Creek	1
140100050403	Upper East Divide Creek	2
140100050405	West Divide Creek above Alkali Creek Composite	2
140100050406	West Divide Creek at Mosquito Creek Composite	2
140100050407	Upper West Divide Creek	2
140100050408	Willow Creek	2
140100050409	Little Muddy Gulch	2
140100050410	Alkali Creek	2
140100050502	East Mamm Creek	2
140100050503	Middle Mamm Creek	2
140100050504	West Mamm Creek	2
140100050601	Mitchell Creek	1
140100050602	Oasis Creek	2
140100050702	Beaver Creek	2
140100050703	Porcupine Creek	1
140100050704	Spruce Creek	2
140100050705	Cache Creek	2
140100050707	Battlement Creek	2
140100050712	Wallace Creek	3
140100050713	Little Alkali Creek	2
140100050714	Alkali Creek	2
140100050715	Horse Thief Creek	2
140100050716	Little Horse Thief Creek	2

Table J-6
Watershed Condition Assessment for Upper White River Unit

6th level HUC	Upper White River Watershed Name	Watershed Condition Class
140500011003	South Fork Williams Fork	2
140500011101	Morapos Creek	2
140500011102	Deer Creek	2
140500020101	Upper Milk Creek	2
140500020102	Milk Creek At Thornburgh Composite	2
140500050101	North Fork White River above Buford Composite	1
140500050102	Fawn Creek	1
140500050103	Ute Creek	1
140500050104	Lower Marvine Creek Composite	1
140500050105	West Marvine Creek	1
140500050106	East Marvine Creek	1
140500050107	Upper Marvine Creek	1
140500050108	North Fork White River above Marvine	1
140500050109	Lost Creek	2
140500050110	Snell Creek	1
140500050111	North Fork White River above Snell	1
140500050112	Ripple Creek	1
140500050113	Fish Creek	1
140500050114	North Fork White River above Rainbow	1
140500050115	Skinny Fish Creek	1
140500050116	North Fork White River around Trappers Lake	1
140500050201	Lower South Fork White River Composite	1
140500050202	Hill Creek	2
140500050203	South Fork White River above Fowler	2
140500050204	Lost Solar Creek	1
140500050205	South Fork White River above Lost Solar	1
140500050206	Park Creek	1
140500050207	Patterson Creek	1
140500050208	Wagonwheel Creek	1
140500050209	Buck Creek	1
140500050210	South Fork White River at the Meadows	1
140500050211	Doe Creek	1
140500050212	Upper South Fork White River	1
140500050301	Flag Creek	2
140500050305	Coal Creek	2
140500050308	Miller Creek	2
140500050309	Dry Creek	2
140500050310	North Elk Creek	2
140500050311	Big Beaver Creek	2

Table J-7
1998 Colorado Monitoring and Evaluation List (CDPHE 2000) – River segments with suspected water quality problems but unknown degree of use support

Upper Colorado River Segment 5	
Description:	Mainstem of the Colorado River from State Bridge to the confluence with the Roaring Fork River
Impairment:	Sediment
Attributed to:	Not specified
Status:	Unknown; additional data needed
Eagle River Segment 3	
Description:	Black Gore Creek, adjacent to I-70
Impairment:	Sediment
Attributed to:	I-70
Status:	Unknown

Table J-8
1998 Colorado State 303d list

The Colorado Department of Health's *Water Quality Limited Segments Still Requiring TMDLs – Colorado's 1998 303(d) List and Related Water Quality Management Lists* (CDPHE 2000) lists the following stream reaches within the forest as still requiring total maximum daily load (TMDL) assessments: TMDL is the amount of a specific pollutant that a water body can accept without exceeding its water quality standard.

Blue River Segment 2	
Segment description:	Mainstem of the Blue River from the confluence with French Gulch to a point one mile above the confluence with Swan River
Portion affected:	All
Impairment:	Cadmium, zinc
Attributed to:	Mining
Use Support Status:	Partially supporting: Aquatic Life, Cold 1
Comments:	Potential problem identified by the Forest Service
Projected completion:	June, 2004

Table J-8 continued

Blue River Segment 6	
Segment description:	Mainstem of the Snake River, including all tributaries, lakes, and reservoirs from the source to Dillon Reservoir
Portion affected:	Below Peru Creek
Impairment:	Cadmium, copper, lead, manganese, zinc
Attributed to:	Not specified
Status:	Partially supporting: Aquatic Life, Cold Water 1, Water Supply, Agriculture
Comments:	Water quality of Snake River depends on Peru Creek improvements
Projected completion:	June, 2006
Blue River Segment 7	
Segment description:	Mainstem of Peru Creek, including all tributaries, lakes, and reservoirs from the source to the confluence with the Snake River
Portion affected:	All
Impairment:	Cadmium, copper, manganese
Attributed to:	Mining
Status:	Not supporting: Aquatic Life, Cold 1
Projected completion:	June, 2006
Blue River Segment 11	
Segment description:	Mainstem of French Gulch, including all tributaries, from a point 1.5 miles below Lincoln to confluence with Blue River
Portion affected:	All
Impairment:	pH, cadmium, zinc
Attributed to:	Mining
Status:	Not supporting: Aquatic Life, Cold 1
Projected completion:	June, 2004

Table J-8 continued

Blue River Segment 18	
Segment description:	All tributaries of the Blue River from the outlet of Dillon Reservoir to the outlet of Green Mountain Reservoir
Portion affected:	Straight Creek, source to Blue River
Impairment:	Sediment
Attributed to:	Highway runoff
Status:	Partially supporting: Aquatic Life, Cold 1
Projected completion:	June, 2000
Eagle River Segment 5	
Segment description:	Mainstem of the Eagle River from the compressor house bridge at Belden to the confluence with Gore Creek
Portion affected:	All
Impairment:	Cadmium, zinc, manganese
Attributed to:	Mining
Status:	Partially supporting: Aquatic Life, Cold 1, Water Supply
Comments:	Eagle Mine CERCLA site
Projected completion:	June, 2006
Eagle River Segment 7	
Segment description:	Mainstem of Cross Creek from the source to the confluence with the Eagle River except waters in the wilderness
Portion affected:	Lower portion near mouth
Impairment:	Cadmium, zinc, manganese
Attributed to:	Mining
Status:	Not supporting: Aquatic Life, Cold 1 Partially supporting: Water Supply
Comments:	Eagle Mine CERCLA site
Projected completion:	June, 2006

Table J-8 continued

Eagle River Segment 9	
Segment description:	Mainstem of the Eagle River from Gore Creek to the confluence with the Colorado River
Portion affected:	All
Impairment:	Manganese
Attributed to:	Mining
Status:	Partially supporting: Aquatic Life, Cold 1, Water Supply
Comments:	Eagle Mine CERCLA site
Projected completion:	June, 2006
Roaring Fork Segment 9	
Segment description:	Mainstem of Coal Creek including all tributaries, lakes and reservoirs from the source to the confluence with the Crystal River
Portion affected:	All
Impairment:	Iron
Attributed to:	Not specified
Status:	Partially supporting: Aquatic Life, Cold 1, Water Supply
Comments:	Mid-Continent Mine in litigation
Projected completion:	June, 2008

Abandoned mines

A survey by the Colorado Geological Survey of each Ranger District rated the environmental degradation and physical hazards of abandoned mines in or adjacent to the forest. **Table J-3** lists these mines and gives each an environmental degradation rating of slight, potentially significant, significant, or extreme. Additional information can be found in the individual reports (Neubert, Ellis, Wood, and Nichols 1998a, 1998b; Neubert and Ellis 1998; Streufert 1998; and Streufert 1994). These citations are on file at the White River National Forest Supervisor's Office.

Table J-9
Abandoned mines on or adjacent to the White River National Forest.

Site	District	Name of USGS quadrangle map	Rating
Hope Mine	Aspen	Hayden Peak	significant
Pitkin Iron Mine	Aspen	Hayden Peak	significant
Ruby Area	Aspen	Independence Pass	significant
Highland Tunnel	Aspen	Aspen	potentially significant
West of Hunter Peak along East Maroon Creek	Aspen	Maroon Bells	potentially significant
Lower Workings along East Maroon Creek	Aspen	Maroon Bells	potentially significant
Conundrum Creek, West Side	Aspen	Maroon Bells	potentially significant
Sandy Creek	Aspen	Hayden Peak	potentially significant
Montezuma Mine area	Aspen	Hayden Peak	slight
Butterfly	Blanco	Sawmill Mountain	potentially significant
Burrell Claims	Blanco	Sawmill Mountain	potentially significant
Discovery Tunnel area	Eagle	Grouse Mountain	potentially significant
Excelsior Mine/Mill	Dillon	Frisco	significant
Governor Mine	Dillon	Breckenridge	significant
Hamilton Mine	Dillon	Keystone	significant
Jessie Mine	Dillon	Frisco	significant
Oro Saints John Mine	Dillon	Keystone	significant
Silver Spoon	Dillon	Montezuma	significant
Warden Gulch	Dillon	Montezuma	potentially significant
Lower Climax Mine	Dillon	Montezuma	significant
Willard Tunnel	Dillon	Breckenridge	significant
Wellington/Oro Mine	Dillon	Breckenridge	significant
IXL/Royal Tiger	Dillon	Keystone	potentially significant
Holy Cross City	Holy Cross	Holy Cross	potentially significant
Upper Yule Creek	Sopris	Snowmass Mountain	significant
Coal Basin	Sopris	Placita	potentially significant
Lost Trail Creek Workings	Sopris	Marble	potentially significant
Paradise Basin	Sopris	Oh-Be-Joyful	potentially significant

